5. PERCHED WATER

5.1 Background

Several zones of perched water have developed in the vadose zone as a result of INEEL operations and natural recharge sources. The perched water bodies have been found in three zones in the subsurface:

- The interface between the surface alluvium and the shallowest basalt flow.
- An upper zone associated with the C, CD, and DE3 interbeds at depths between 34 and 53 m (100 and 170 ft) bgs. This shallow zone is further subdivided into an upper shallow zone and a lower shallow zone.
- A lower zone associated with the DE6 and DE8 interbeds at a depth of about 97 to 128 m (320 to 420 ft) bgs.

Figure 5-1 shows a geologic cross section running from north to south through INTEC. The figure shows the nomenclature of the individual basalt flows or flow groups and interbeds. Also depicted are locations and depths where perched water was measured during 2001. Figure 5-2 shows similar data plotted on a west-to-east cross section of the northern portion of INTEC. Table 5-1 presents the individual perched water well construction data as well as measured water levels for 2001 for each of the perched water wells. The table reports the highest water level measured, the lowest water level measured, and the mean water level measured for the year 2001.

The perched water contains varying degrees of radionuclide concentrations, with the northern upper perched water zone showing the highest concentrations. The chemistry of the perched water bodies is discussed in Section 6.

5.2 Perched Water in the Surficial Alluvium

In places with a concentrated source of surface recharge, a perched water zone can develop in the surficial alluvium on top of the first basalt flow. Perched water has been identified as occurring intermittently in the alluvium at INTEC beneath surface disposal ponds (the percolation ponds and the sewage treatment ponds). Additionally, a small perched water table in the alluvium was encountered west of building CPP-603 during the 1960s. The source for the perched water was assumed to be wastewater that was discharged to a shallow seepage pit (Robertson et al. 1974).

Perched water in the surficial alluvium requires a concentrated source of recharge that exceeds the normal recharge provided by precipitation. Perched water has not been widely measured at the sediment-basalt interface.

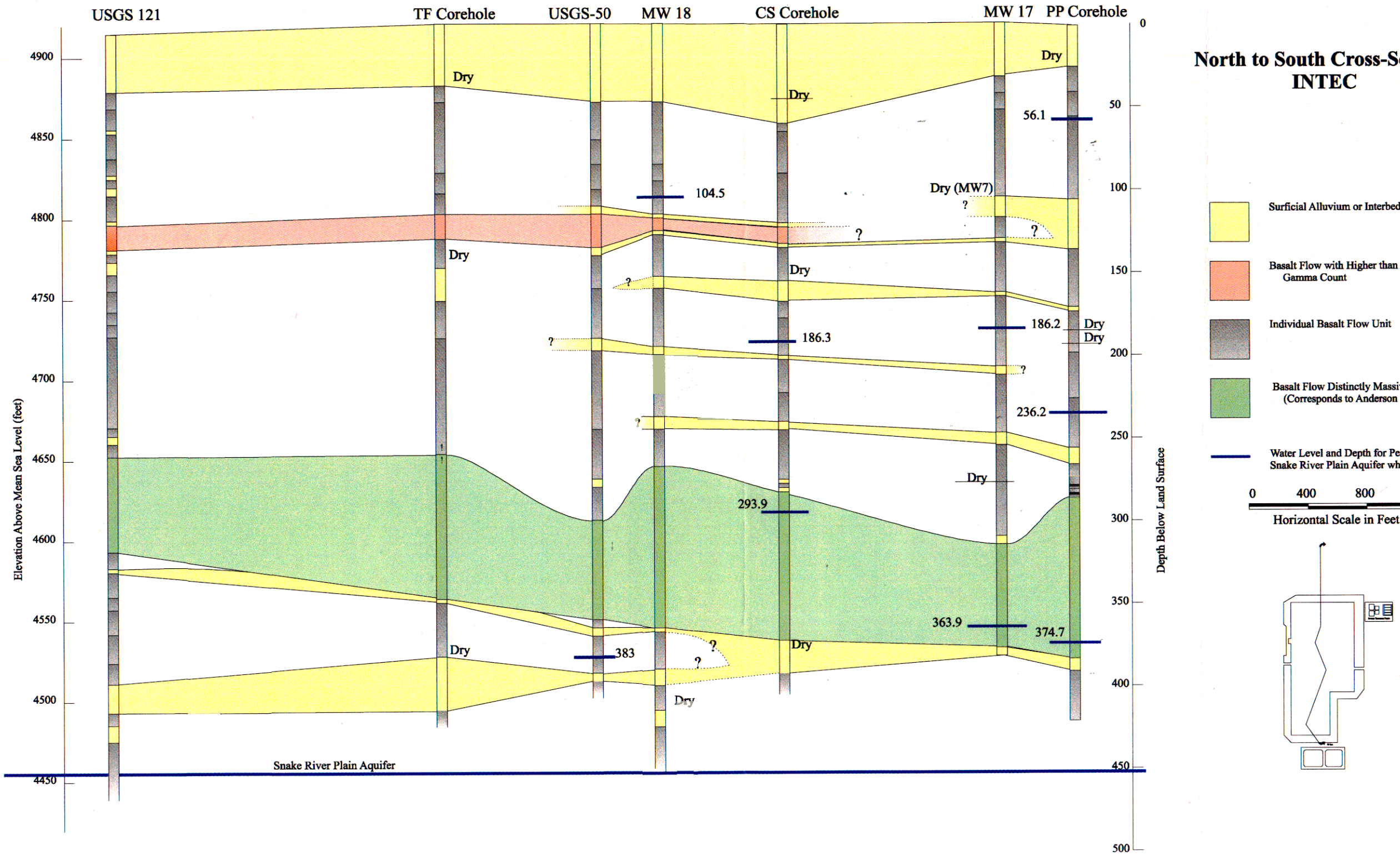


Figure 5-1. North-to-south cross section of INTEC showing occurrence of perched water.

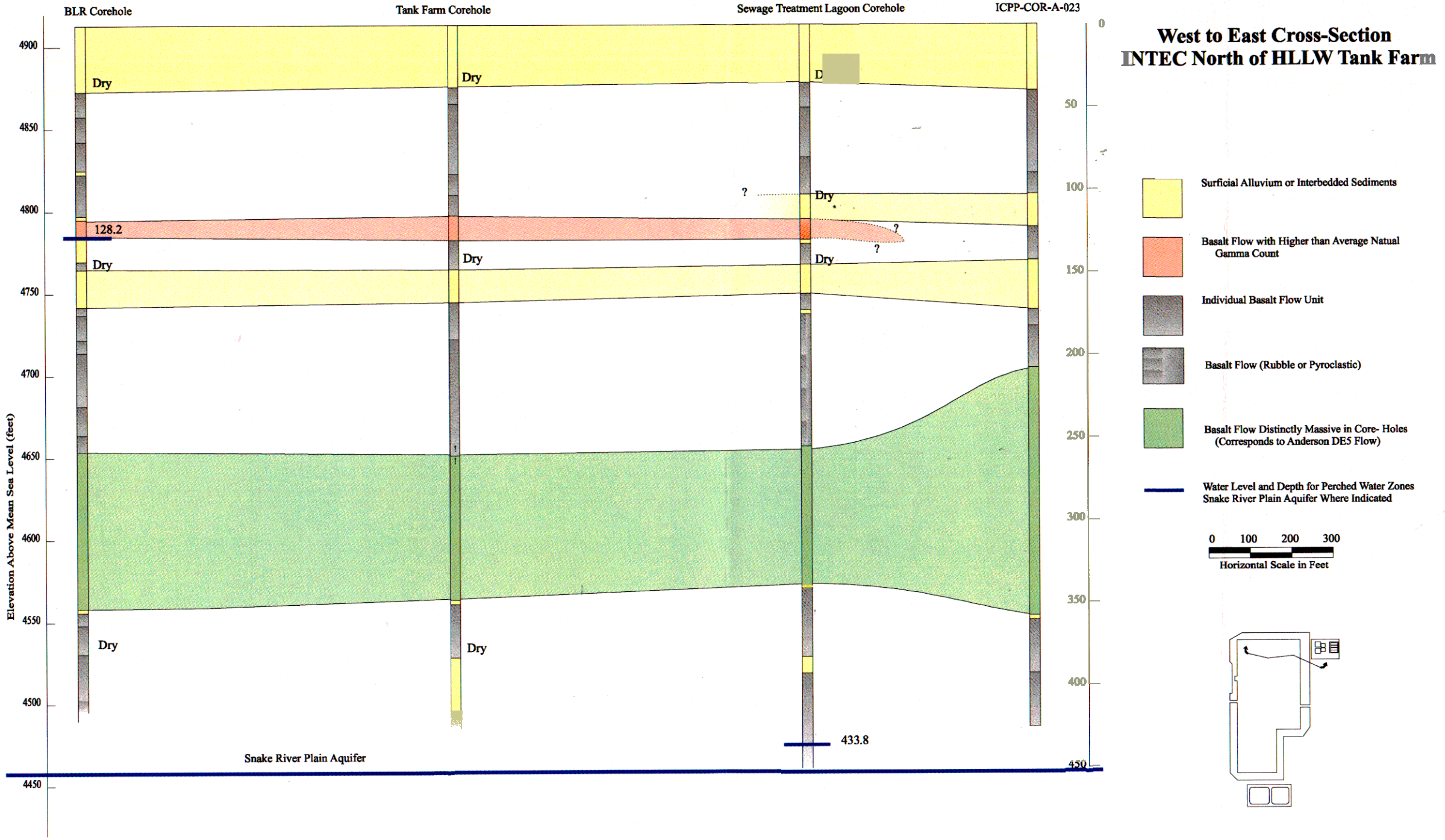


Figure 5-2. West-to-east cross section of INTEC (north end) showing occurrence of perched water.

Table 5-1. INTEC perched water well data and water levels.

Well	Alias	Type	Northing	Easting	Land Surface Elevation	Measure Point Elevation	Total Depth Drilled		Well Screen (Footage)		Water Measurement From Land Surface (1/4/01 to 10/11/01)			Water Measurement From Measuring Point (1/4/01 to 10/11/01)		
							Footage	Elevation	Top	Bottom	High	Low	Median	High	Low	Median
CPP-33-1	33-1	2-in. well	695392	296939	4915.2	4917.4	113.6	4801.6	89.0	99.0	98.6	Dry	98.6	100.8	Dry	100.8
CPP-33-2	33-2	2-in. well	695385	296639	4914.2	4915.4	114.7	4799.5	85.8	105.8	100.51	105.31	103.59	101.71	106.51	104.79
CPP-33-3	33-3	2-in. well	695806	296659	4913.7	4916.2	126.4	4787.3	111.8	121.8	115.68	116.28	116.19	118.18	118.78	118.69
CPP-33-4	33-4	2-in. well	696049	297011	4911.9	4914.0	124.0	4787.9	98.2	118.2	102.71	104.71	103.52	104.81	106.81	105.62
CPP-37-4	37-4	2-in. well	695861	297743	4911.0	4912.7	129.3	4781.7	99.9	109.9	103.3	107.52	104.35	105.0	109.22	106.05
CPP-55-06	55-06	2-in. well	695057	297563	4911.6	4913.2	122.9	4788.7	93.1	113.1	104.11	110.09	107.99	105.71	111.69	109.59
INTEC-MON-P-001 (4-in.)	MW-1-4	4-in. well	694731	296099	4916.5	4919.3	395.0	4521.5	326.0	336.0	324.32	327.12	324.67	327.12	329.92	327.47
INTEC-MON-P-001 (1-in.)	MW-1-1	1-in. piezo	694731	296099	4916.5	4919.0	395.0	4521.5	359.0	369.0	Dry	Dry	Dry		Dry	
INTEC-MON-P-002	MW-2	2-in. well	695285	297262	4913.1	4916.1	127.0	4786.1	102.0	112.0	103.99	110.76	107.26	106.99	113.76	110.26
INTEC-MON-P-003 (2-in.)	MW-3-2	2-in. well	695215	296369	4916.0	4918.5	151.3	4764.7	128.0	138.0	136.9	137.81	137.44	139.4	140.31	139.94
INTEC-MON-P-003 (1-in.)	MW-3-1	1-in. piezo	695215	296369	4916.0	4918.5	151.3	4764.7	116.3	118.0	118.72	119.26	119.1	121.22	121.76	121.6
INTEC-MON-P-004 (2-in.)	MW-4-2	2-in. well	695376	297828	4911.4	4914.2	131.0	4780.4	100.6	110.6	107.7	Dry	108.71	110.5	Dry	111.51
INTEC-MON-P-004 (1-in.)	MW-4-1	1-in. piezo	695376	297828	4911.4	4913.8	131.0	4780.4	128.0	129.7	128.18	129.76	129.42	130.58	132.16	131.82
INTEC-MON-P-005	MW-5	2-in. well	695110	297064	4916.4	4919.3	141.0	4775.4	106.5	126.5	111.47	117.24	112.13	114.37	120.14	115.03
INTEC-MON-P-006	MW-6	2-in. well	695690	296320	4916.5	4919.3	161.0	4755.5	117.0	137.0	115.54	127.24	116.9	118.34	130.04	119.7
INTEC-MON-P-007 (2-in.)	MW-7-2	2-in. well	693209	296726	4917.4	4920.1	177.0	4740.4	132.0	142.0	137.69	138.94	138.19	140.39	141.64	140.89
INTEC-MON-P-007 (1-in.)	MW-7-1	1-in. piezo	693209	296726	4917.4	4920.1	177.0	4740.4	102.3	104.0	Dry	Dry	Dry		Dry	
INTEC-MON-P-008	MW-8	2-in. well	694806	297514	4911.7	4914.4	141.0	4770.7	115.0	125.0	123.42	Dry	123.49	126.12	Dry	126.19
INTEC-MON-P-009 (2-in.)	MW-9	2-in. well	693168	296357	4919.6	4922.3	158.0	4761.6	120.0	130.0	122.9	130.42	127.89	125.6	133.12	130.59
INTEC-MON-P-009 (1-in.)	MW-9	1-in. well	693168	296357	4919.6	4922.3	158.0	4761.6	104.2	105.7	106.01	Dry	106.01	108.71	Dry	108.71
INTEC-MON-P-010 (2-in.)	MW-10-2	2-in. well	695356	297078	4914.7	4917.4	181.0	4733.7	141.0	151.0	144.92	148.79	145.31	147.62	151.49	148.01
INTEC-MON-P-010 (1-in.)	MW-10-1	1-in. piezo	695356	297078	4914.7	4917.4	181.0	4733.7	76.5	78.0	Dry	Dry	Dry		Dry	
INTEC-MON-P-011 (2-in.)	MW-11-2	2-in. well	694435	296854	4919.9	4920.7	150.5	4769.4	131.0	136.0	130.98	Dry	137.9	131.78	Dry	138.7
INTEC-MON-P-011 (1-in.)	MW-11-1	1-in. piezo	694435	296854	4919.9	4920.7	150.5	4769.4	112.0	113.5	Dry	Dry	Dry		Dry	
INTEC-MON-P-012 (2-in.)	MW-12-2	2-in. well	695107	297336	4913.0	4916.0	153.0	4760.0	109.0	119.0	118.61	Dry	118.71	121.61	Dry	121.71
INTEC-MON-P-012 (1-in.)	MW-12-1	1-in. piezo	695107	297336	4913.0	4916.0	153.0	4760.0	148.6	150.3	150.69	Dry	150.77	153.69	Dry	153.77
INTEC-MON-P-013	MW-13	2-in. well	693106	296561	4919.9	4922.0	128.0	4791.9	100.0	105.0	Dry	Dry	Dry		Dry	
INTEC-MON-P-014	MW-14	2-in. well	693594	296503	4919.1	4921.6	138.0	4781.1	94.0	104.0	Dry	Dry	Dry		Dry	
INTEC-MON-P-015	MW-15	2-in. well	693059	296608	4918.9	4921.3	143.0	4775.9	111.3	131.3	113.84	Dry	120.03	116.24	Dry	122.43
INTEC-MON-P-016	MW-16	2-in. well	693173	296648	4919.1	4921.7	126.0	4793.1	97.0	107.0	Dry	Dry	Dry		Dry	
INTEC-MON-P-017 (2-in.)	MW-17-2	2-in. well	693209	296726	4918.3	4921.1	381.0	4537.3	181.7	191.7	185.7	186.89	186.18	188.5	189.69	188.98
INTEC-MON-P-017 (1-in.)	MW-17-1	1-in. piezo	693209	296726	4918.3	4921.1	381.0	4537.3	263.8	273.8	Dry	Dry	Dry		Dry	
INTEC-MON-P-017 (4-in.)	MW-17-4	4-in. well	693209	296726	4918.3	4921.1	381.0	4537.3	360.0	381.0	361.07	366.1	363.91	363.87	368.9	366.71
INTEC-MON-P-018 (2-in.)	MW-18-2	2-in. well	695020	297193	4914.0	4917.32	494.0	4420.0	105.0	115.0	Dry	Dry	Dry		Dry	
INTEC-MON-P-018 (1-in.)	MW-18-1	1-in. piezo	695020	297193	4914.0	4917.33	494.0	4420.0	394.0	414.0	404.40	413.19	411.94	407.73	409.86	408.61
INTEC-MON-P-018 (4-in.)	MW-18-4	4-in. well	695020	297193	4914.0	4917.31	494.0	4420.0	459.0	479.0	Dry	Dry	Dry		Not taken	
INTEC-MON-P-020 (2-in.)	MW-20-2	2-in. well	695568	297309	4915.0	4917.0	151.5	4763.5	133.2	148.4	133.16	138.04	137.71	135.16	140.04	139.71
INTEC-MON-P-020 (1-in.)	MW-20-1	1-in. piezo	695568	297309	4915.0	4917.0	151.5	4763.5	96.0	106.0	105.12	Dry	105.89	107.12	Dry	107.89

Table 5-1. (continued).

Well	Alias	Type	Northing	Easting	Land Surface Elevation	Measure Point Elevation	Total Depth Drilled		Well Screen (Footage)		Water Measurement From Land Surface (1/4/01 to 10/11/01)			Water Measurement From Measuring Point (1/4/01 to 10/11/01)		
							Footage	Elevation	Top	Bottom	High	Low	Median	High	Low	Median
INTEC-MON-P-024	MW-24		696334	298856	4906.4	4908.6					59.09	66.77	59.78	61.29	68.97	61.98
PW-1	PW-1	6-in. well	692272	296235	4917.8	4919.13	120.0	4797.8	100.0	120.0	89.66	112.96	91.95	90.99	114.29	93.28
PW-2	PW-2	6-in. well	691791	297011	4917.0	4918.54	131.0	4786.0	111.0	131.0	119.57	122.37	120.92	121.11	123.91	122.46
PW-3	PW-3	6-in. well	692448	296961	4916.7	4918.12	125.0	4791.7	103.0	123.0	110.09	118.45	117.62	111.51	119.87	119.04
PW-4	PW-4	6-in. well	692198	297573	4914.8	4918.3	150.0	4764.8	110.0	150.0	58.79	64.27	65.35	62.29	67.77	68.85
PW-5	PW-5	6-in. well	692199	296981	4916.4	4918.4	131.0	4785.4	109.0	129.0	68.95	74.84	70.8	70.95	76.84	72.8
PW-6	PW-6	6-in. well	692697	295151	4920.5	4922.34	135.0	4785.5	105.0	125.0	Dry	Dry	Dry		Dry	
USGS-50	USGS-50	4-in. well	695249	296636	4913.5	NA	405.0	4508.5	356.0	405.0	382.82	383.56	383.29	382.82	383.56	383.29
ICPP-MON-A-230	TF-Aquifer	6-in. stainless steel	696122.6	296977.2	4912.41	4914.81	523.0	4389.41	443.0	483.0	456.67	456.83	456.75	459.07	459.23	459.15
ICPP-SCI-P-216	BLR-AL	1.25-in. PVC	696438.1	296190.3	4913.64	4916.11	37.0	4876.64	35.4	35.9	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-217	BLR-SP	1-in. PVC	696435.5	296150.9	4913.73	4916.18	180.5	4733.23	140.0	145.5	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-218	BLR-DP	4-in. stainless steel	696473.0	296189.0	4913.48	4915.82	400.0	4513.48	375.0	385.0	374.17	375.46	374.91	376.51	377.8	377.25
ICPP-SCI-P-219	STL-AL	1.25-in. PVC	696380.0	297750.5	4909.31	4911.63	31.5	4877.81	30.4	30.9	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-220	STL-SP	Lys/Tens only	696412.9	297780.9	4909.44	4911.75	170.0	4739.44	Lys/Tens			Not taken			Not taken	
ICPP-SCI-P-221	STL-DP	4-in. stainless steel	696412.2	297751.9	4909.43	4912.10	440.0	4469.43	429.0	439.0	433.42	434.09	433.76	436.09	436.76	436.43
ICPP-SCI-P-222	PP-AL	1.25-in. PVC	692535.3	296832.8	4916.76	4919.37	33.0	4883.76	30.8	31.3	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-223	PP-SP	1-in. PVC	692536.9	296990.1	4917.04	4919.79	193.0	4724.04	180.0	182.0	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-224 (1-in.)	PP-DP (S)	1-in. PVC	692538.5	296958.7	4917.06	4918.72	398.0	4519.06	50.0	55.0	54.85	58.01	56.13	56.51	59.67	57.79
ICPP-SCI-P-224 (4-in.)	PP-DP (D)	4-in. stainless steel	692538.5	296958.7	4917.06	4918.72	398.0	4519.06	372.0	382.0	373.49	375.34	374.75	375.15	377.0	376.41
ICPP-SCI-P-225	CS-SP	1-in. PVC	694337.6	296919.3	4914.46	4916.89	167.0	4747.46	159.0	164.0	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-226 (P1)	CS-DP (4-in.)	4-in. stainless steel	694337.6	296919.3	4914.46	4916.89	167.0	4747.46	368.0	378.0	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-226 (P2)	CS-DP (1 1/4-in.)	1.25-in. PVC	694385.1	296942.1	4914.54	4916.80	405.0	4509.54	288.5	293.0	293.55	294.62	293.91	295.81	296.88	296.17
ICPP-SCI-P-227	TF-AL	1.25-in. PVC	696122.4	296898.6	4912.43	4914.89	39.0	4873.43	37.5	38.0	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-228	TF-SP	1-in. PVC	696123.3	296951.2	4912.22	4914.80	202.0	4710.22	145.0	150.0	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-229	TF-DP	4-in. stainless steel	696121.3	296871.5	4912.43	4914.61	390.0	4522.43	375.0	385.0	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-247	CS-AL	1.25-in. PVC	694353.6	296940.5	4914.48	4916.93	46.5	4867.98	45.5	46.0	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-248	BLR-CH	2-in. stainless steel	696472.5	296150.9	4913.52	4916.06	414.7	4498.82	120.0	130.0	125.28	132.96	128.20	127.82	135.5	130.74
ICPP-SCI-P-249	CS-CH		694325.3	296938.8	4914.48	4917.00	402.0	4512.48	188.0	198.0	185.82	186.77	186.29	188.34	189.29	188.81
ICPP-SCI-P-250 (P-1)	PP-CH (1-in.)	1-in. PVC	692537.2	297025.0	4916.59	4919.06	414.8	4501.79	187.0	192.0	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-250 (P-2)	PP-CH (2-in.)	2-in. stainless steel	692537.2	297025.0	4916.59	4919.06	414.8	4501.79	235.0	255.0	234.73	236.78	236.15	237.2	239.25	238.62
ICPP-SCI-P-251 (P-1)	STL-CH (1-in.)	1-in. PVC	696380.0	297780.3	4909.73	4912.27	451.0	4458.73	99.0	109.0	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-251 (P-2)	STL-CH (2-in.)	2-in. stainless steel	696380.0	297780.3	4909.73	4912.27	451.0	4458.73	140.0	145.0	Dry	Dry	Dry	Dry	Dry	Dry
ICPP-SCI-P-252	TF-CH	2-in. stainless steel	696123.1	296925.4	4912.36	4914.97	325.0	4587.36	145.0	150.0	Dry	Dry	Dry	Dry	Dry	Dry

5.2.1 New Wells Measuring Alluvium Zone

Boreholes were constructed at each of the well set locations to measure water or moisture within the lower portion of the alluvium. Most wells were equipped with tensiometers, lysimeters, and piezometers set just above the basalt interface. Table 5-2 lists the installations for alluvium moisture-measuring installations. Refer to Figure 3-1 for locations of the boreholes.

Table 5-2. Alluvium installations.

Well Name	Alias	Instrument Type/Placement or Screened Interval (ft)
ICPP-SCI-P-216	BLR-Alluvial	Lysimeter (32.3)
		Tensiometer (32.9)
		Piezometer (35.4-35.9)
ICPP-SCI-P-219	STL-Alluvial	Lysimeter (26)
		Tensiometer (26.5)
		Piezometer (30.4-30.9)
ICPP-SCI-P-222	PP-Alluvial	Lysimeter (26.6)
		Tensiometer (27.4)
		Piezometer (30.8-31.3)
ICPP-SCI-P-247	CS-Alluvial	Lysimeter (40.9)
		Tensiometer (41.5)
		Piezometer (45.5-46.0)
ICPP-SCI-P-227	TF-Alluvial	Tensiometer (35)
		Lysimeter (35)
		Piezometer (37.5-38)

5.2.2 Moisture Measurements in the Alluvium

5.2.2.1 Piezometer Water Levels. Water levels were manually measured through the use of an electronic tape water level line during a period starting January 4, 2001. Some of the Group 4, Phase I wells were not completed until after that date. Data are presented in Table 5-1 for the period January 4 (or completion date of the well) through October 11, 2001. No alluvium wells were found to contain standing water at any time during the measurement period.

5.2.2.2 Tensiometer Data. Tensiometer data for the alluvium tensiometers and other zones are shown in Figures 5-3 through 5-7.

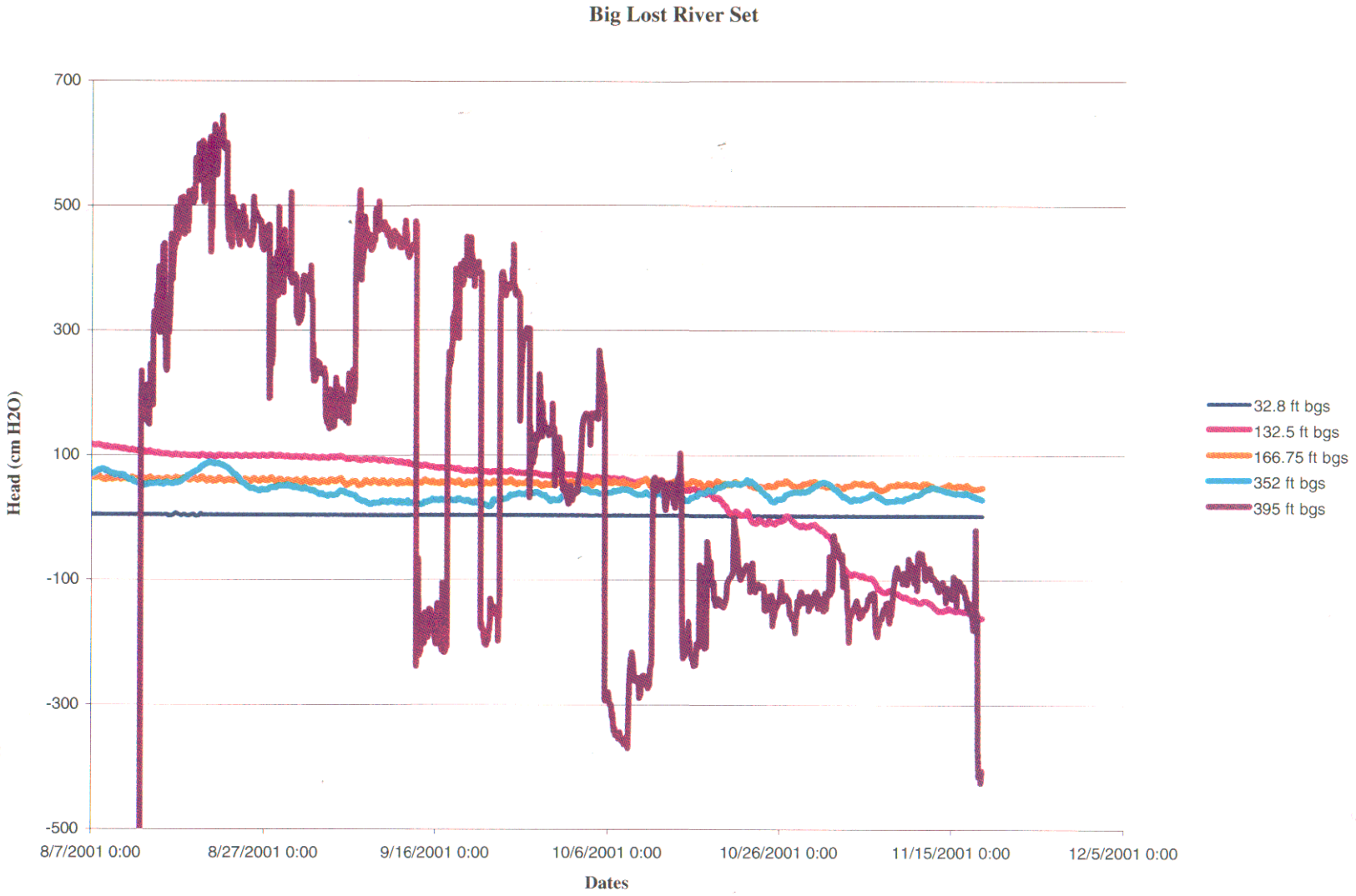


Figure 5-3. BLR set tensiometer data.

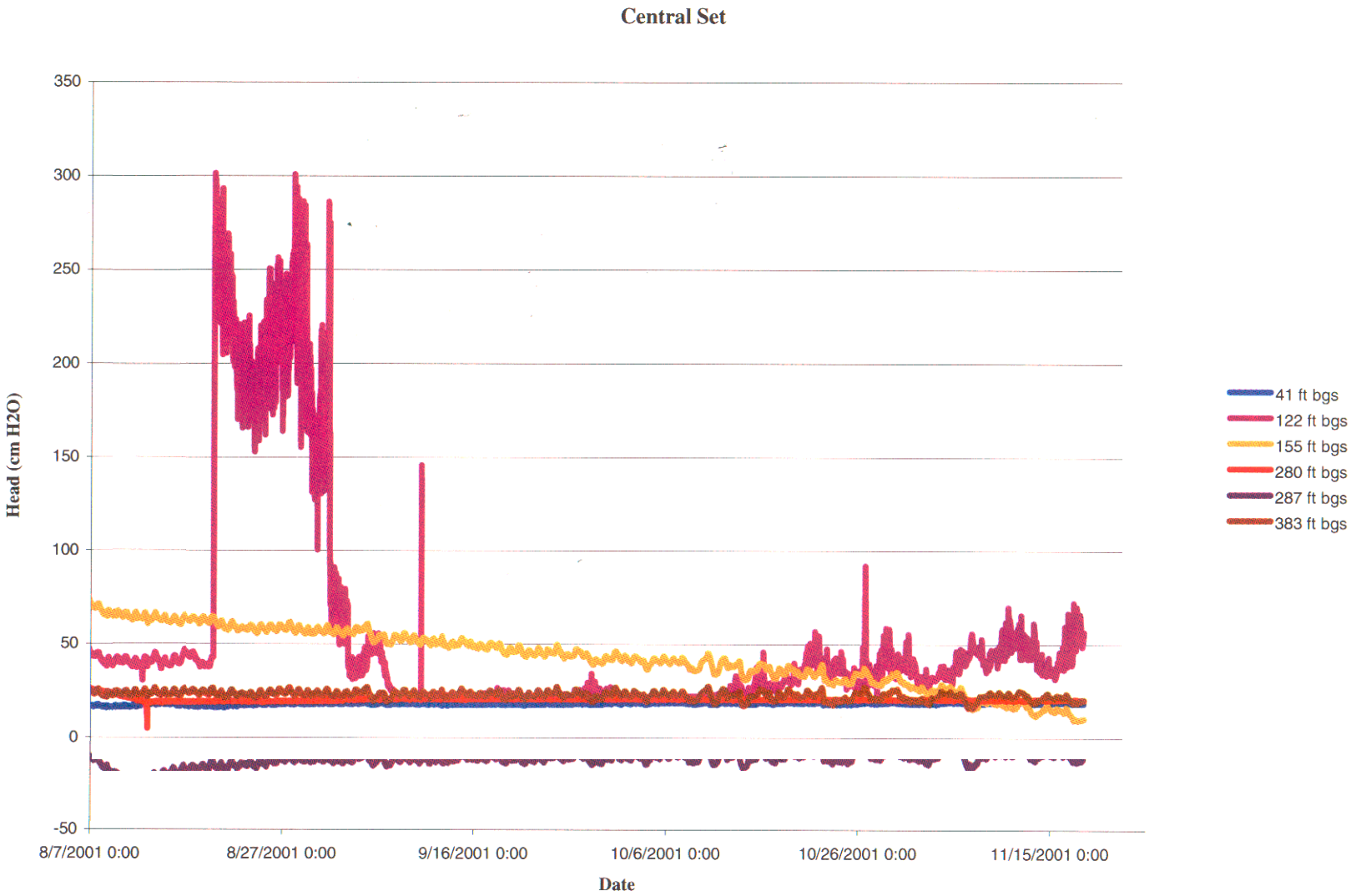


Figure 5-4. Central set tensiometer data.

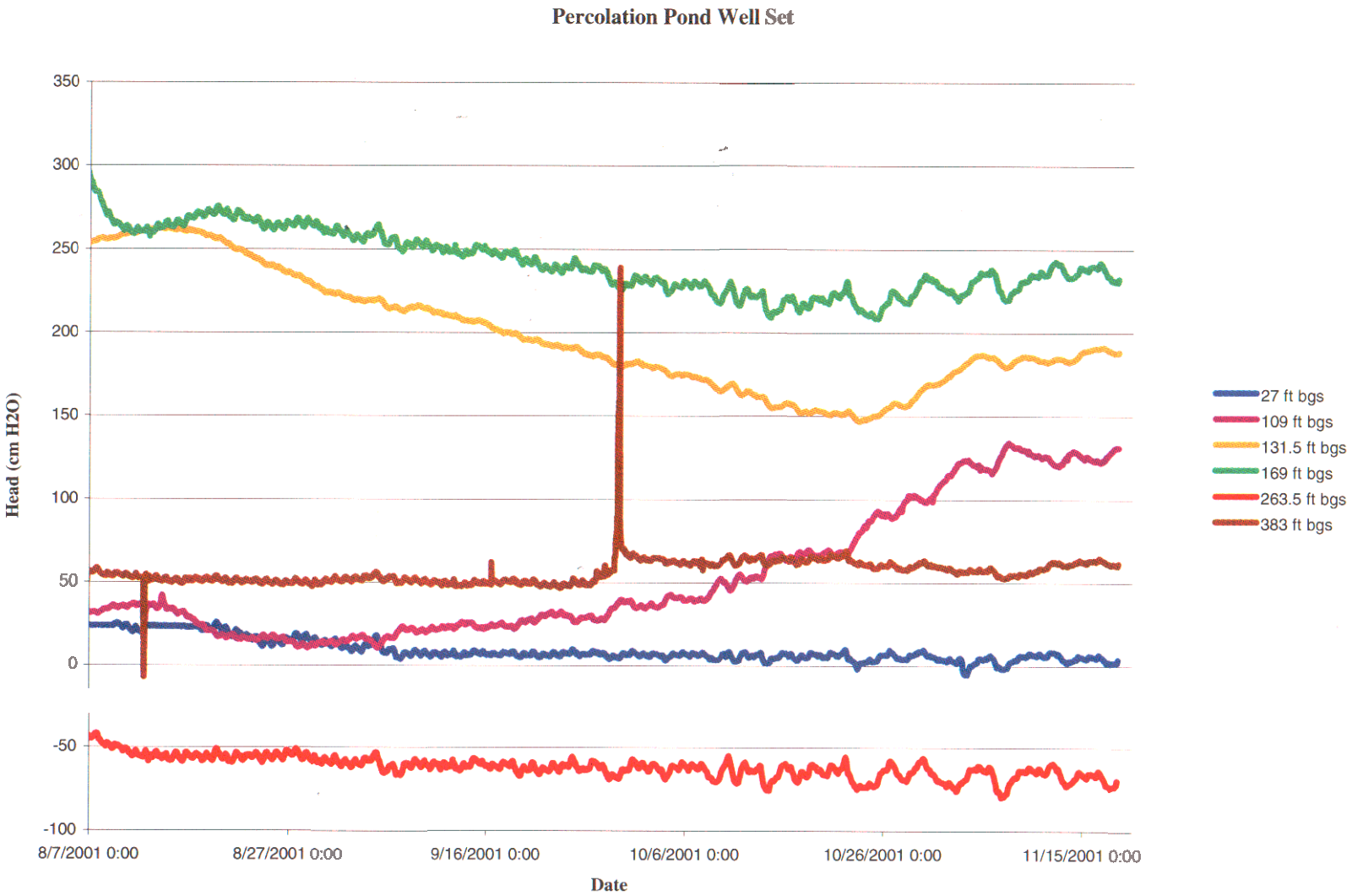


Figure 5-5. Percolation pond set tensiometer data.

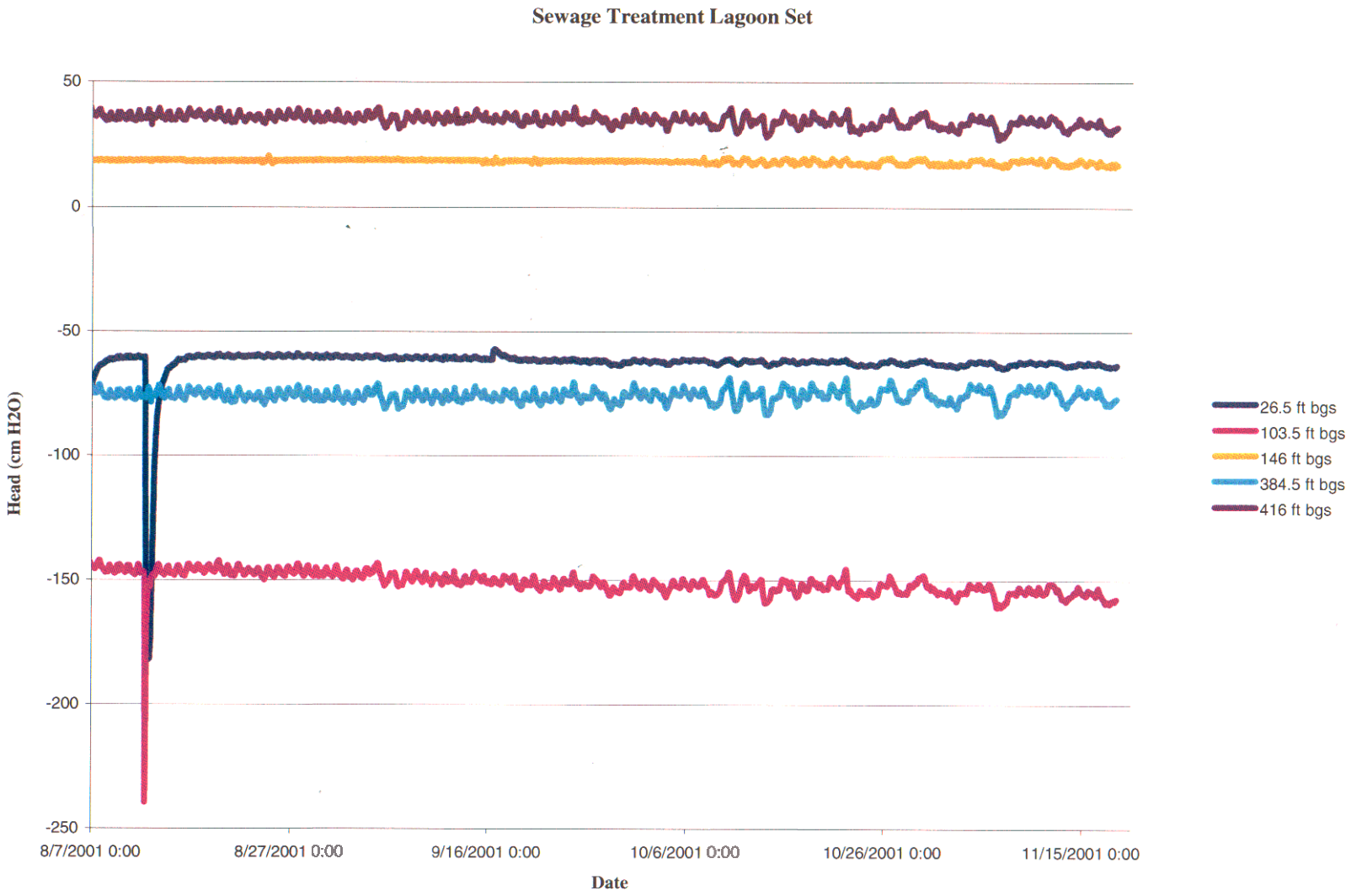


Figure 5-6. Sewage treatment lagoon set tensiometer data.

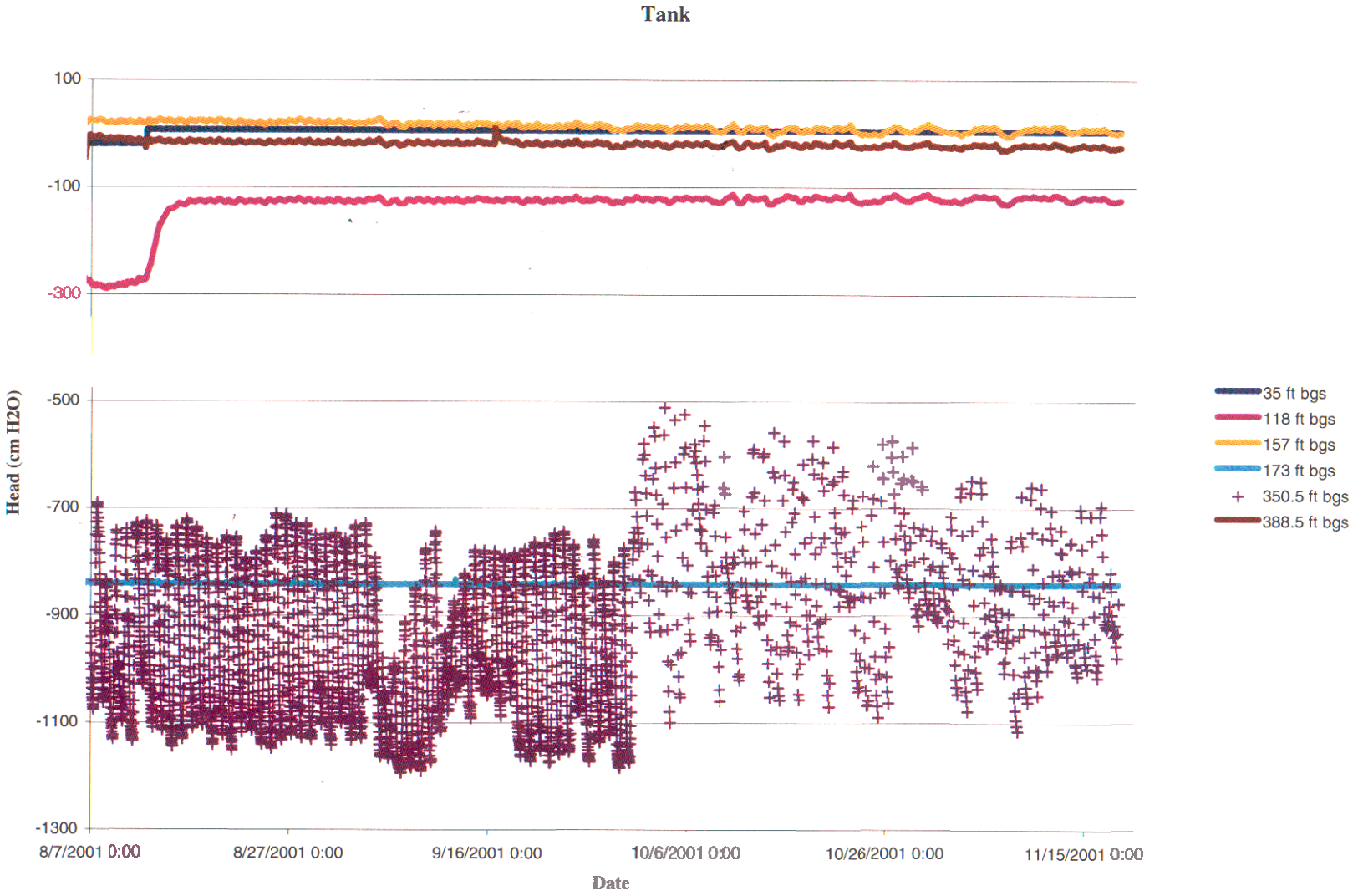


Figure 5-7. Tank farm set tensiometer data.

5.3 Shallow Perched Water

The upper perched water zones occur as fragmented, rather than continuous, perched water bodies. As shown in Figures 5-1 and 5-2, the upper portion of the shallow perched water body, when present, occurs above the CD and D interbeds, and the lower portion of the upper perched water body has been identified on the DE3 interbed. The CD interbed occurs at depths between 32 and 36 m (105 and 125 ft) bgs, the D interbed occurs at depths between 39 and 41 m (128 and 135 ft) bgs, and the DE3 interbed occurs at depths between 50 and 52 m (163 and 170 ft) bgs.

There are two discrete upper perched water zones, the northern and southern zones, which are physically separate and differ chemically. Figure 5-8 shows an interpretation of the approximate extent of the upper perched water zones measured during the year 2001. The actual extent of the perched water bodies could be quite different, because the perched water boundaries are not well defined. The connections between the perched water bodies are not well understood.

Based on the upper perched water configuration, it is possible that multiple water sources are providing recharge to the upper perched water body in the northern portion of INTEC. These sources may include recharge from the BLR, the wastewater treatment lagoons, and operational water distribution system releases. A tracer study was begun in 2001 to help differentiate the contributions of these possible recharge sources. The results of the tracer study are discussed in Section 7.

Perched water has been identified beneath two areas of southern INTEC. A small perched water body has been identified in the vicinity of building CPP-603, and a larger perched water body has developed from the discharge of wastewater to the percolation ponds. The water elevations in the southern perched water zones range between 1,442.4 and 1,460.0 m (4,732.4 and 4,790.2 ft) near CPP-603 and between 1,461.9 and 1,477.9 m (4,796.2 and 4,848.9 ft) amsl around the percolation ponds. Before the drilling of new wells under the Group 4, Phase I drilling program, only two upper perched water wells were located between the northern and southern perched water bodies (MW-11 and -14). An additional well set was installed during the drilling program to provide additional data concerning this area. See Figure 3-1 for the location of this well set.

Several cross sections have been prepared to illustrate the occurrence of perched water in the "shallow" zone. Figures 5-9 through 5-12 present cross sections that show the inferred lithology of the wells, the as-built specifications, and the depth of measured water during the 2001 measuring period.

5.3.1 Historical Perched Water Data

Data loggers were placed in several of the shallow perched water wells in 1993 and 1994. The data from these instruments are presented in Figure 5-13. The figure also presents flow and temperature in the BLR measured at Lincoln Boulevard.

5.3.1.1 Northeastern Area Shallow Perched Water Wells. Hydrographs of wells 33-4, 37-4, and MW-4 appear to respond in a similar fashion to water level changes. A hydrograph of these three wells is presented in Figure 5-14.

5.3.1.2 Wells 55-06 and MW-2 Shallow Perched Water Wells. Hydrographs of wells 55-06 and MW-2 appear to respond in a similar fashion to water level changes. A hydrograph of these two wells is presented in Figure 5-15. Earlier data from 1994 have suggested a similar response in wells MW-2 and MW-5. Well MW-5 was not equipped with a data logger and cannot be included in this graph or compared to these hydrographs.

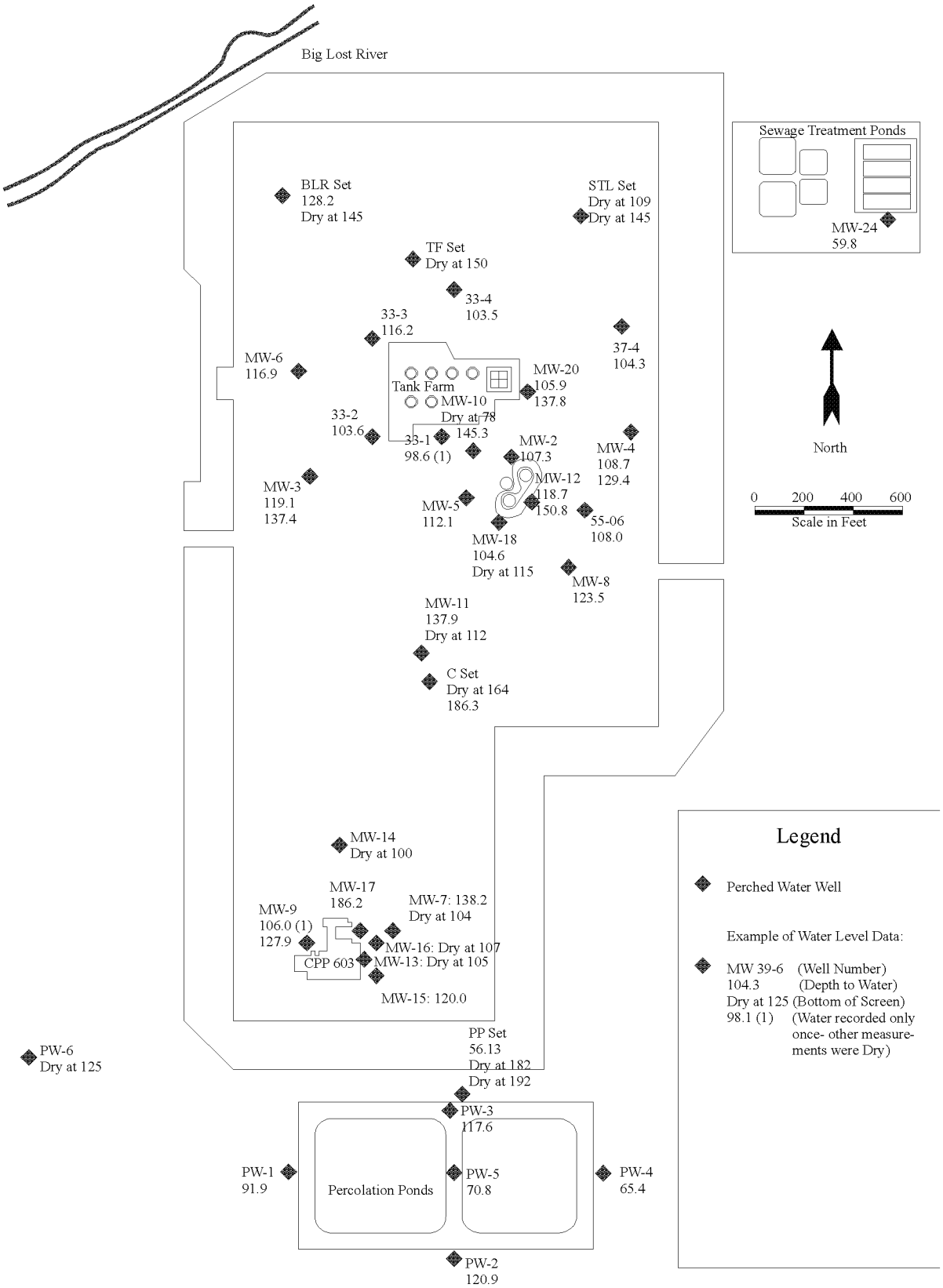


Figure 5-8. Depth of the shallow perched water at INTEC.

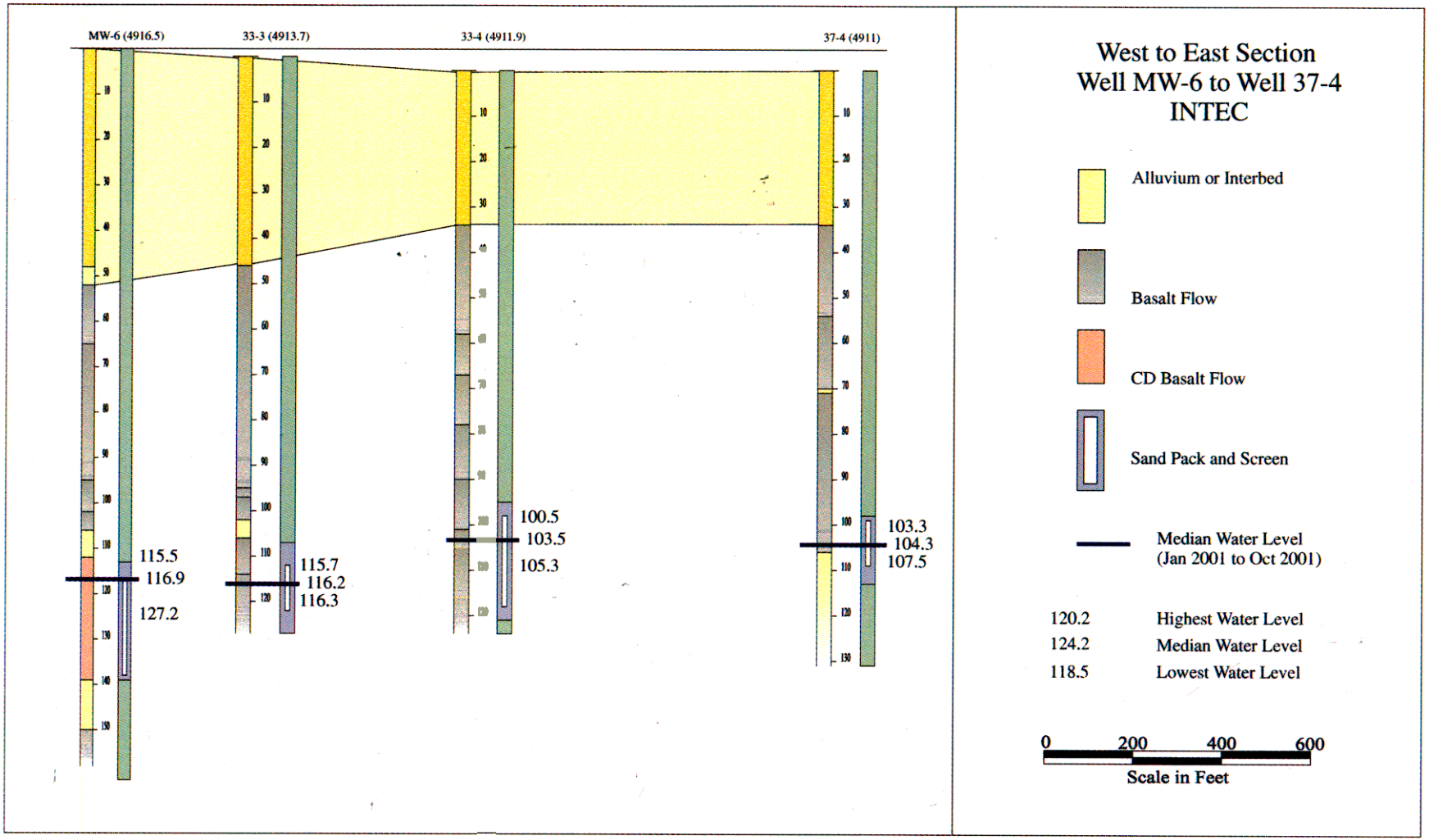


Figure 5-9. Cross section showing lithology, well construction details, and measured water (MW-6 to 37-4).

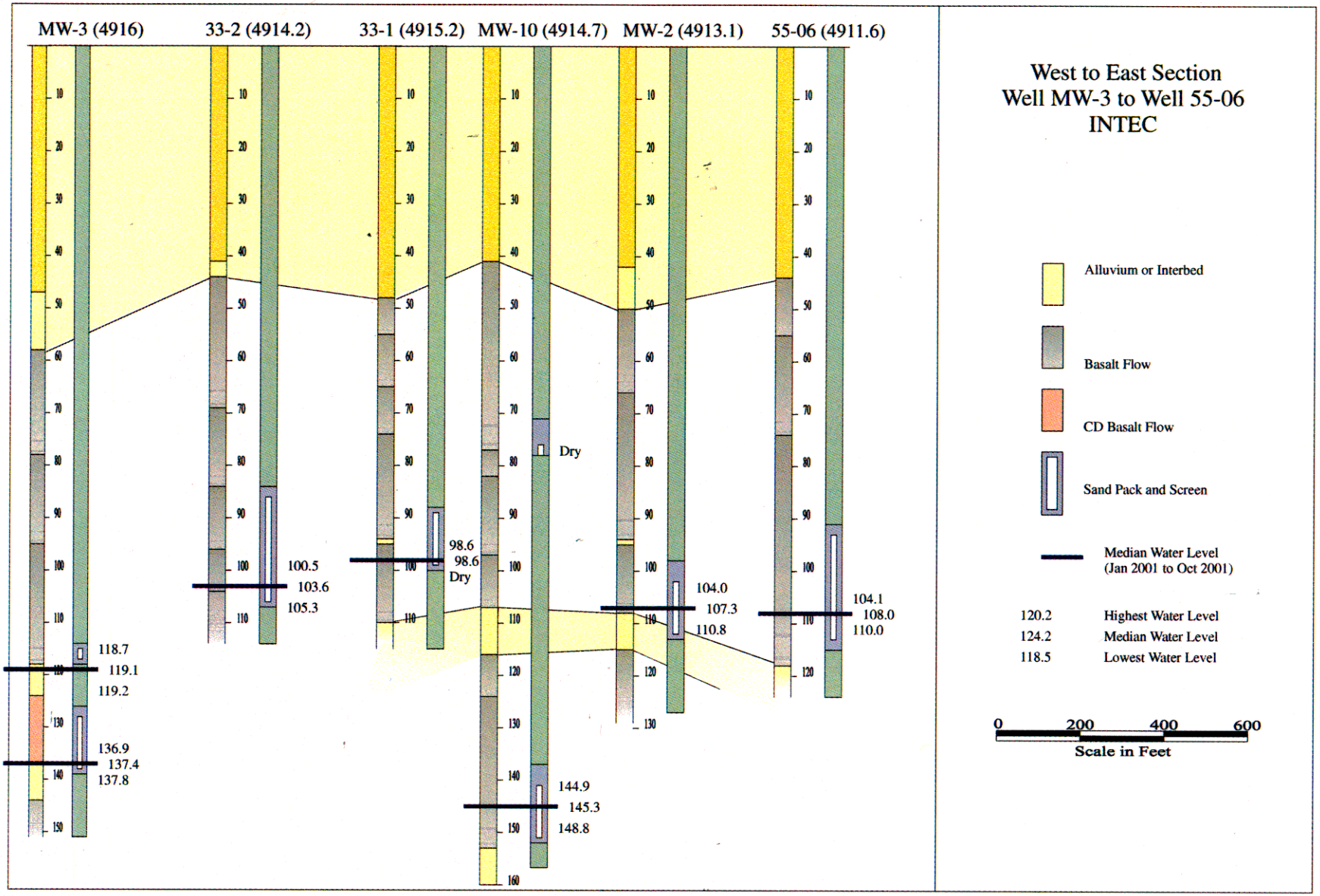
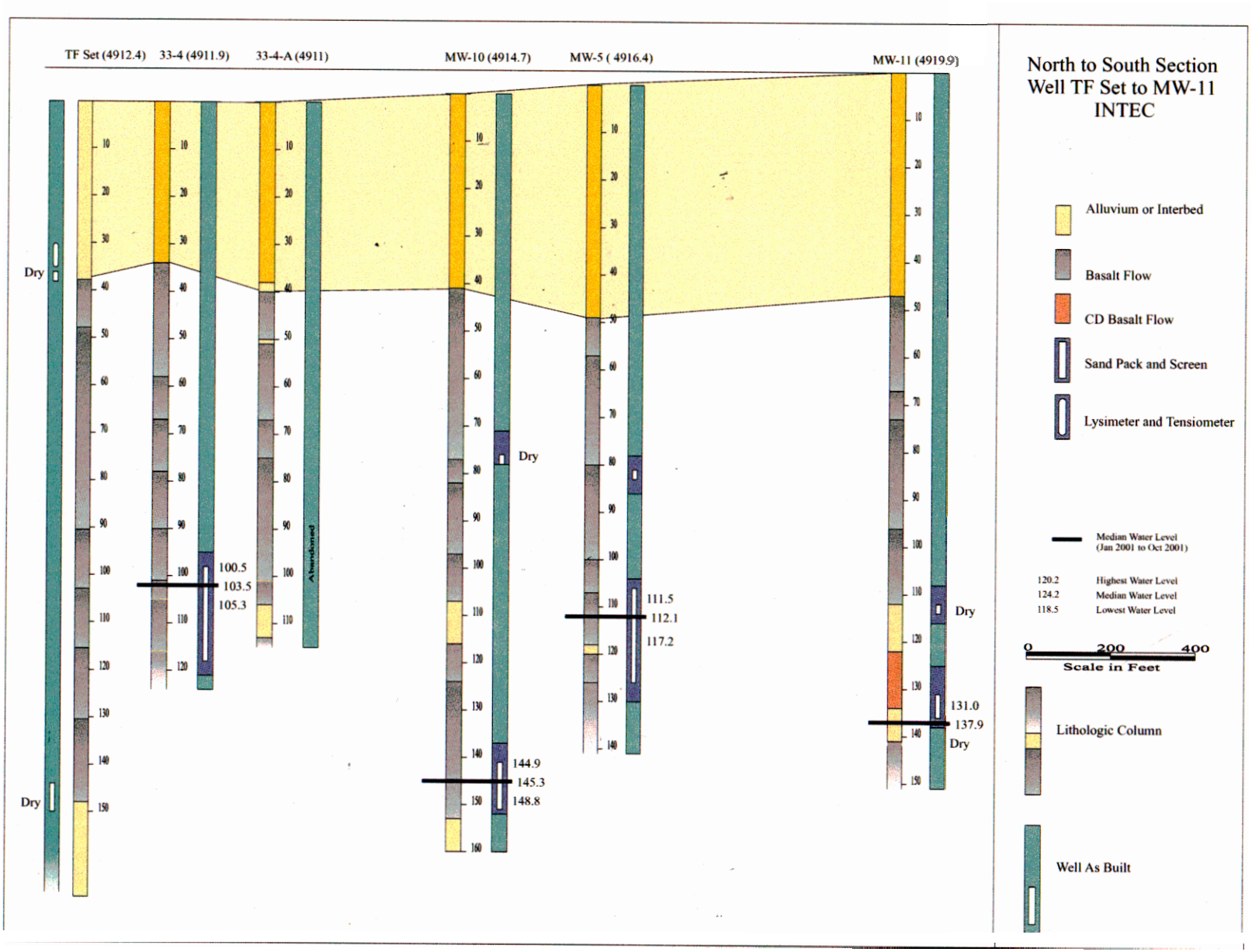


Figure 5-10. Cross section showing lithology, well construction details, and measured water (MW-3 to 55-06).



igure Cross sectio owing lithology, construc detai measured ater (tank farm set to MW-11).

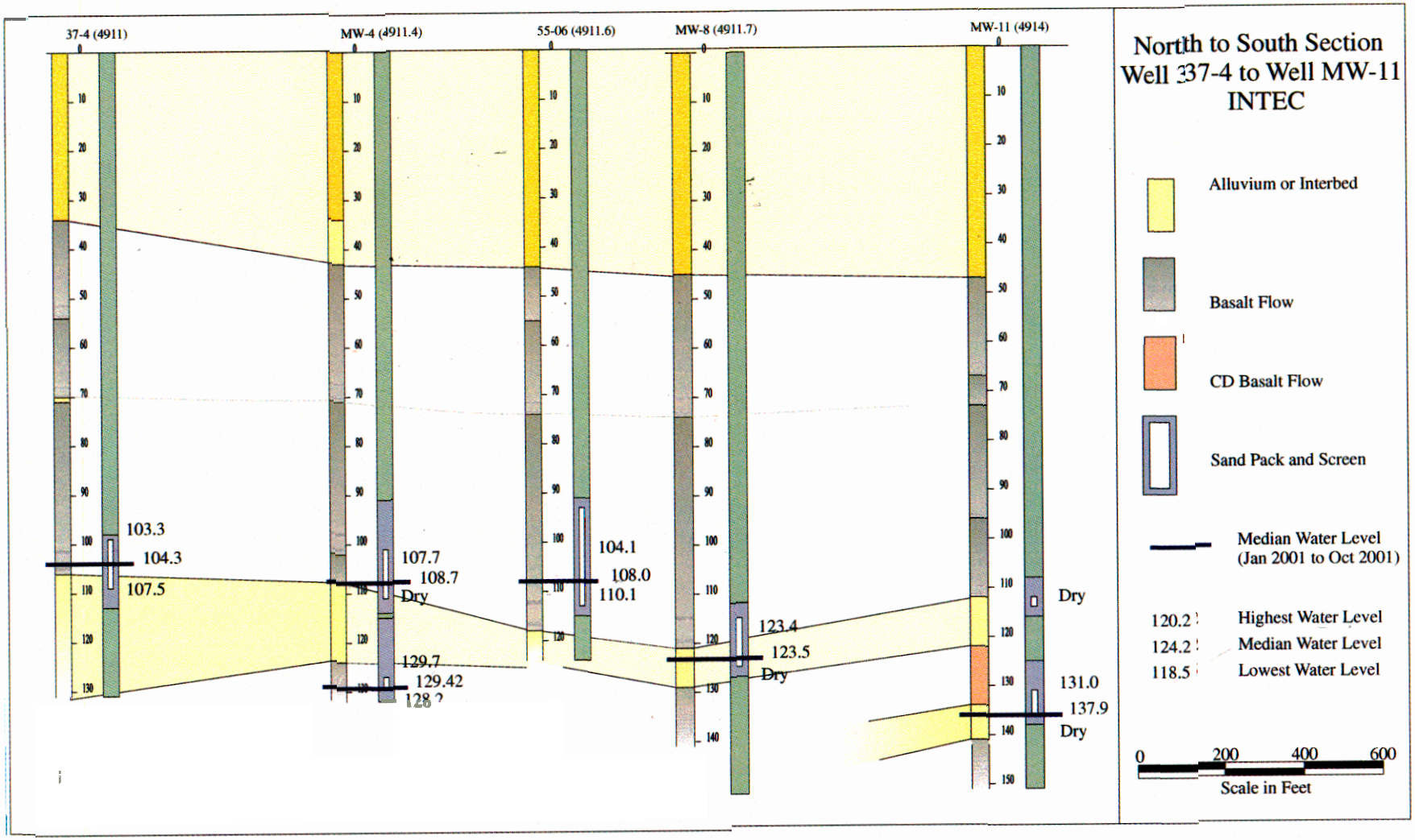


Figure 5-12. Cross section showing lithology, well construction details, and measured water (37-4 to 55-06).

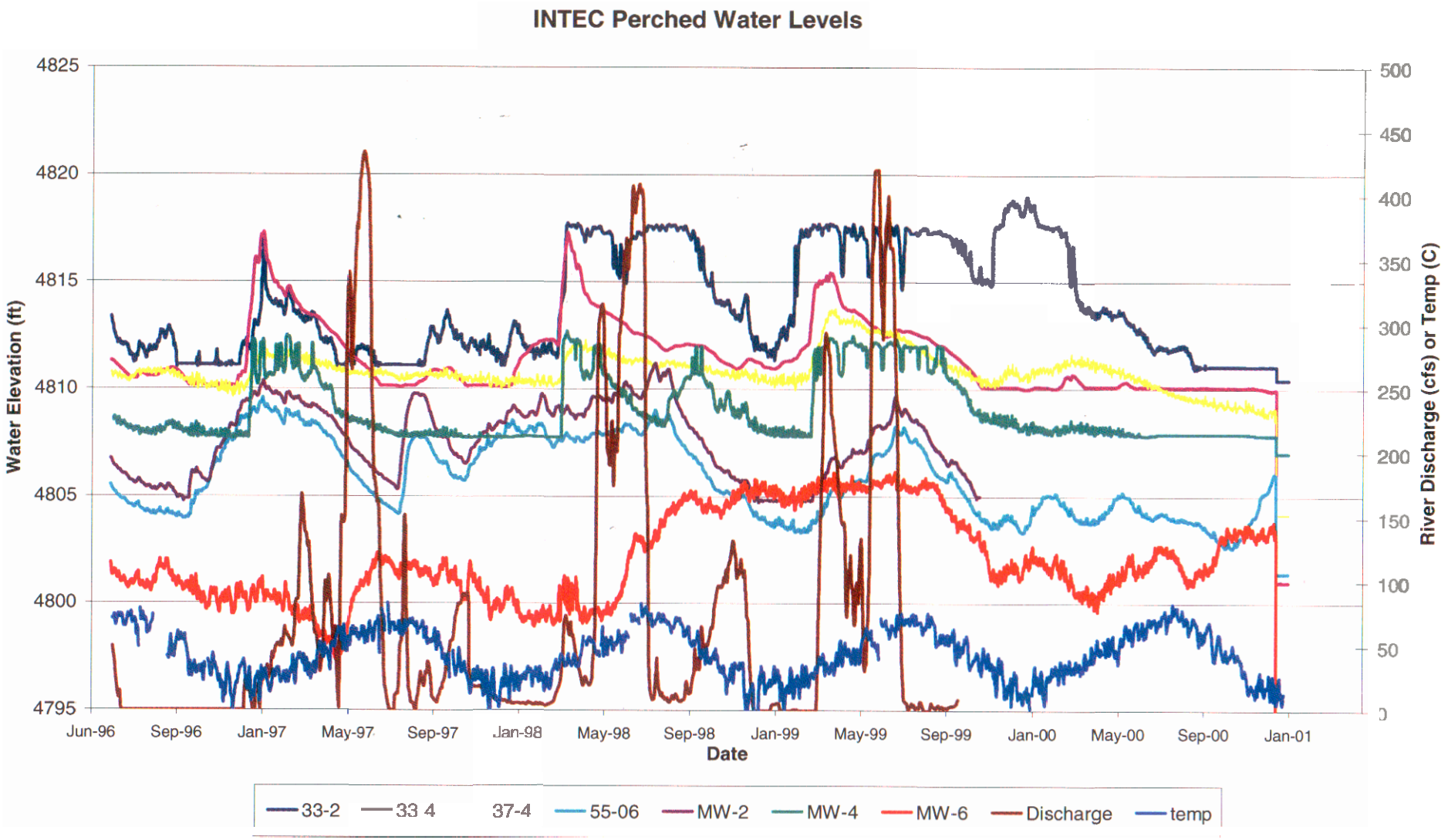


Figure 5-13. Well sentinel data for shallow perched water wells.

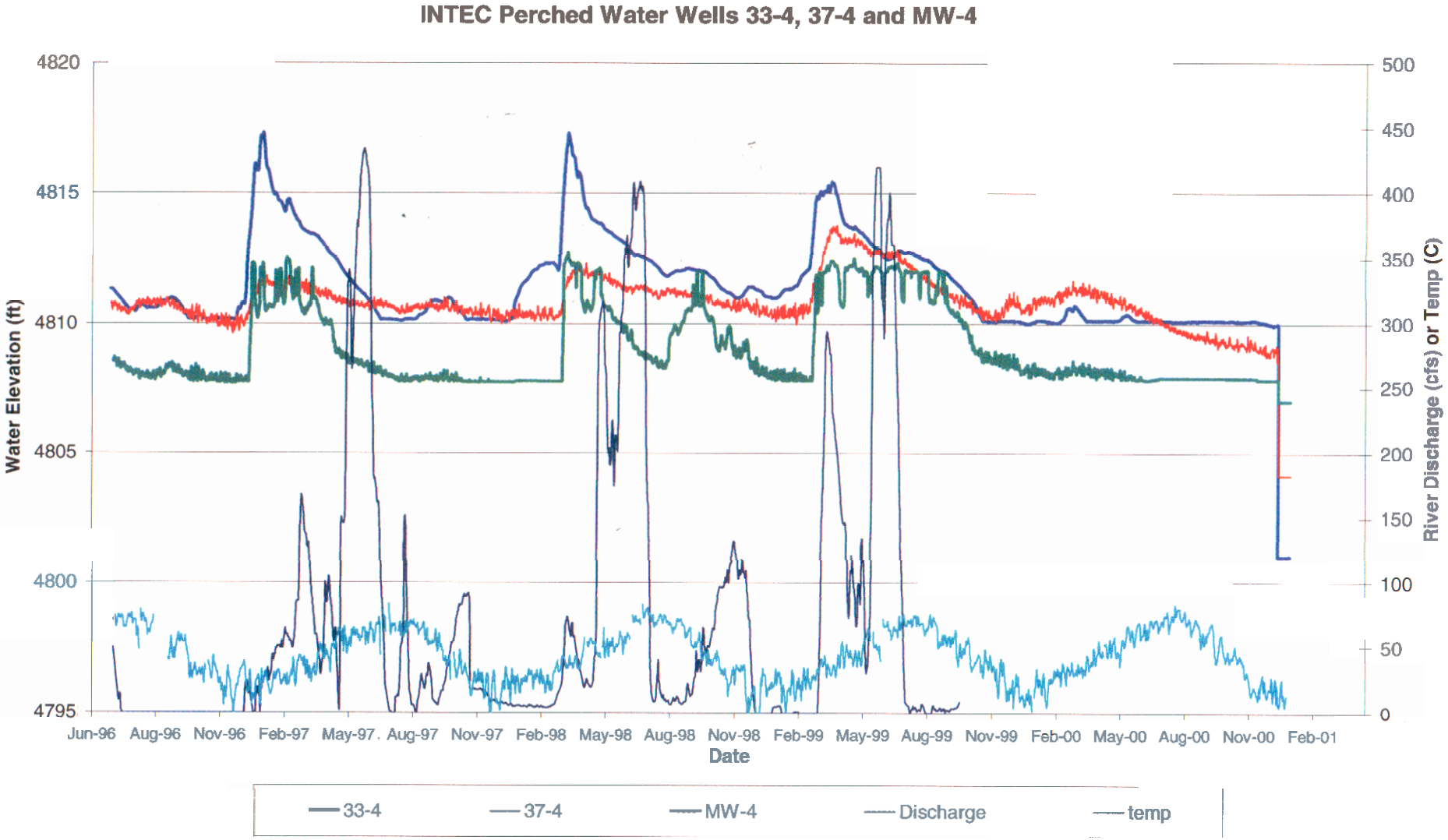


Figure 5-14. Hydrograph of wells CPP 33-4, CPP 37-4, and MW-4.

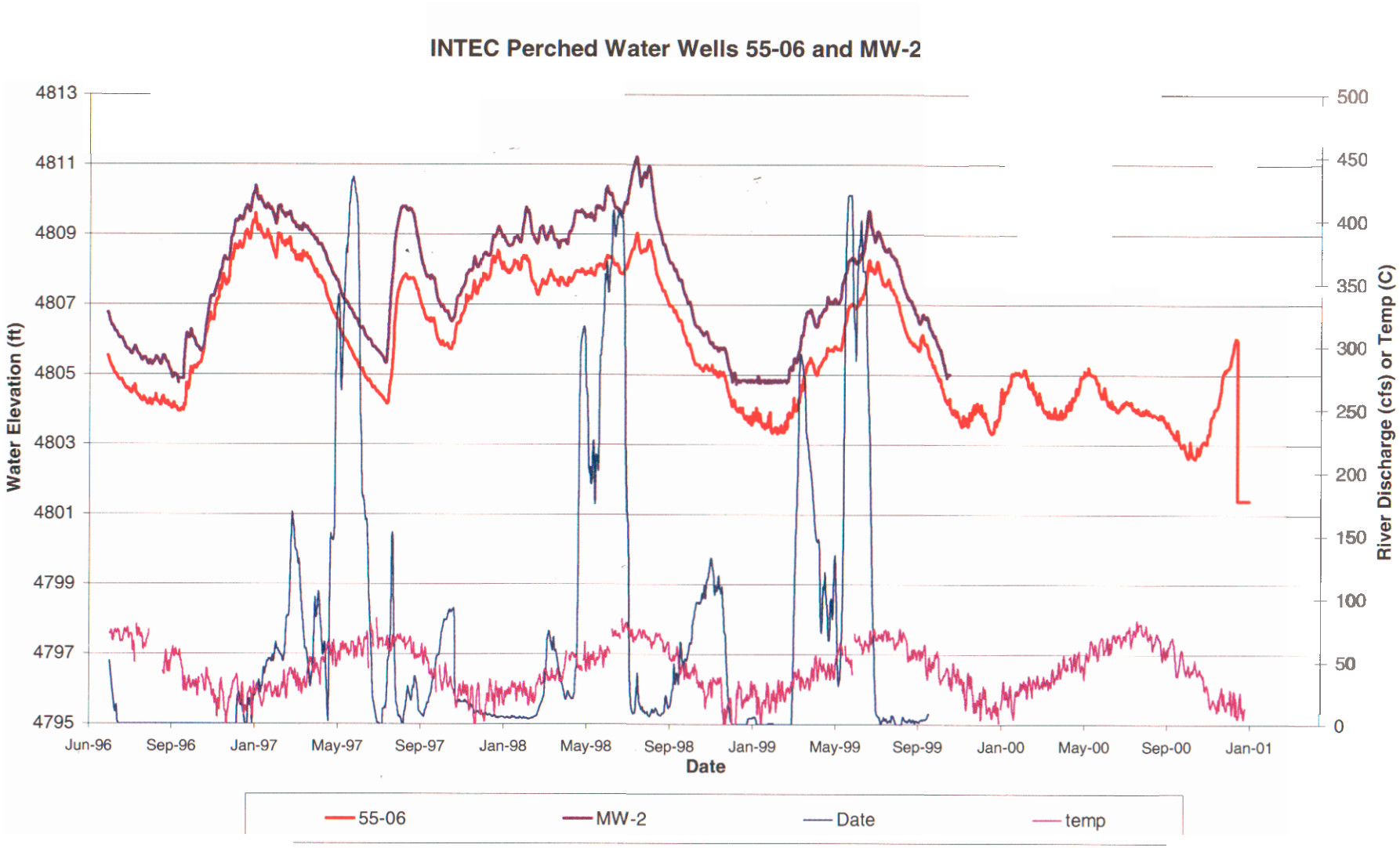


Figure 5-15. Hydrograph of wells CPP 55-06 and MW-2.

5.3.2 Lower Perched Water Zone

A deep perched water zone has been identified under INTEC in the basalt between 98 and 128 m (320 and 420 ft) bgs. This zone of perched water was first discovered in 1956, when perched groundwater was encountered at a depth of 106 m (348 ft) while drilling well USGS-40 (Robertson et al. 1974). Since then, perched water has been encountered in this zone during the drilling of wells USGS-41, USGS-43, USGS-44, USGS-50, USGS-52, MW-1, MW-17, and MW-18. Borehole neutron logs run from wells USGS-40, USGS-43, USGS-46, USGS-51, and USGS-52 indicate that in 1993 perched water may still have been present in this zone.

Prior to the Group 4, Phase I drilling, only four wells were completed in the deep perched water zone. Wells MW-1, MW-18, and USGS-50 are completed in the northern portion of INTEC, and water has been encountered at approximately 85, 107.5, and 101 m (322, 407, and 383 ft) bgs, respectively. In the southern portion of the INTEC facility, only well MW-17D was completed in the lower perched water zone in which water is encountered at a depth of approximately 96 m (364 ft) bgs. Five additional wells (identified as "C" in the new well sets) were drilled and installed into this zone as part of the 2000/2001 drilling program. Several lysimeters and tensiometers were also installed to monitor moisture within this zone (Table A-3-1 provides construction details about the wells). Measured water level information can be found in Table 5-1, and data from the tensiometers can be found in Figures 5-3 through 5-8. Figures 5-1 and 5-2 illustrate the depth of this perched water zone. The depth of water is plotted by well location in Figure 5-16.

Similar in origin to the upper perched water zone, this lower zone is formed by decreased permeability associated with sedimentary interbed layers. The top of this interbed occurs beneath INTEC at depths ranging from 101 to 112.5 m (383 to 426 ft) bgs.

Water levels in the lower perched water zone have been monitored since the early 1960s in USGS-50. The water level in this well has been fairly consistent, ranging between 87.5 and 116 m (287and 382 ft) bgs. In the late 1960s and 1970s, however, the water level increased by approximately 27.4 m (90 ft) in response to failure of the INTEC injection well, Site CPP-23. During this period, wastewater was discharged directly to the vadose zone from the INTEC injection well at a reported depth of 69 m (226 ft) bgs (Fromm et al. 1994). Measurements made in 1966 showed that the well was intact. Therefore, most of the collapse took place in 1967 or early 1968. The period when the INTEC injection well was plugged and discharged directly into the vadose zone has resulted in a thick zone of contamination underlying INTEC. This zone serves as a possible source of contamination to the deep perched water zone and complicates any interpretation of contamination in the subsurface.

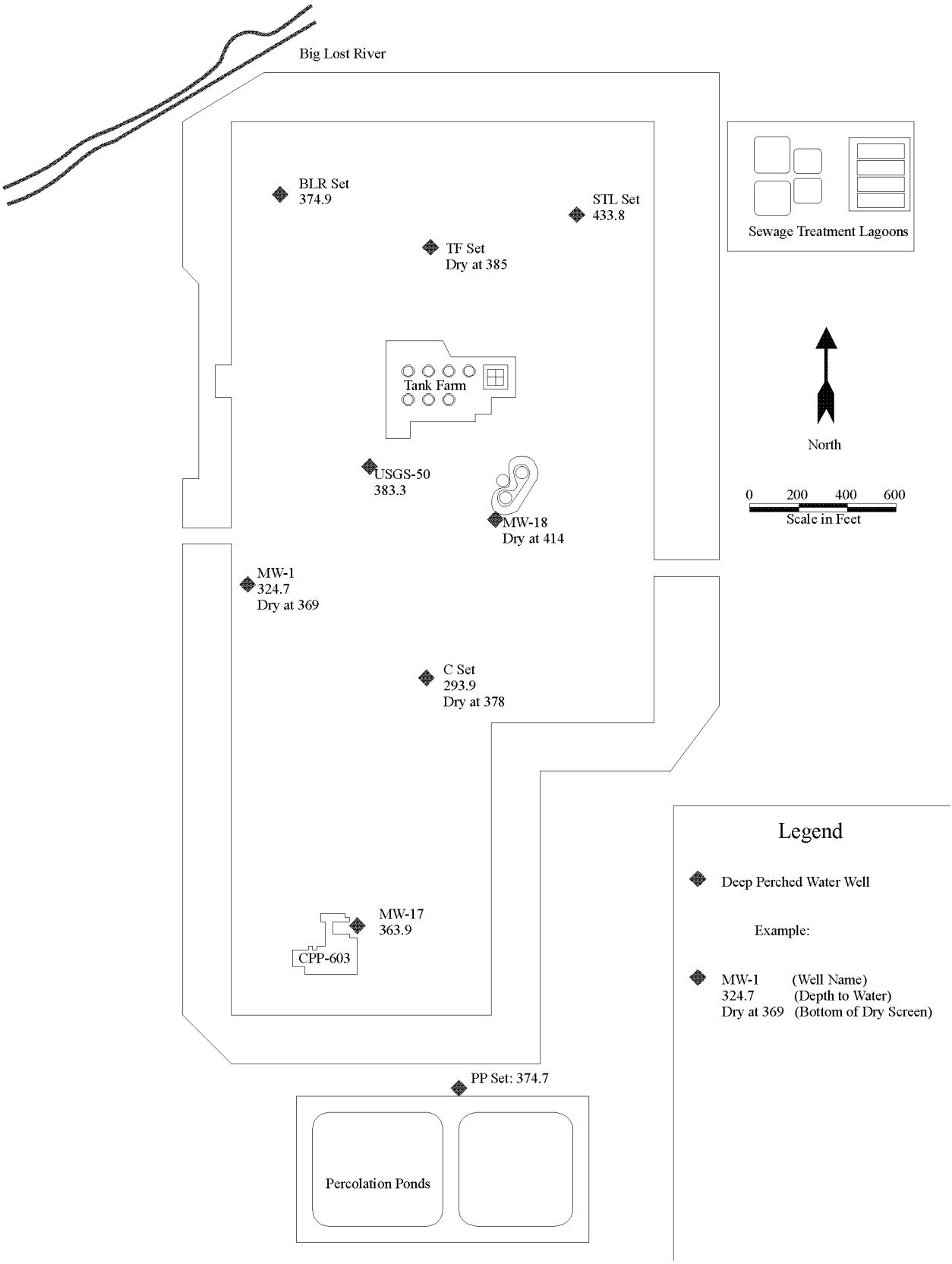


Figure 5-16. Map of the depth of the deep perched water zone.